ABSTRACT OF THE DISCLOSURE

There is provided a system and methods for segmenting datapath resources such as reorder buffers, physical registers, instruction queues and load-store queues, etc. in a microprocessor so that their size may be dynamically expanded and contracted. This is accomplished by allocating and deallocating individual resource units to each resource based on sampled estimates of the instantaneous resource needs of the program running on the microprocessor. By keeping unused datapath resources to a minimum, power and energy savings are achieved by shutting off resource units that are not needed for sustaining the performance requirements of the running program. Leakage energy and switching energy and power are reduced using the described methods.